LAMINATED PAPER STOCKS AND FLEXIBLE PACKAGING MADE THEREFROM

This application claims the benefit of U.S. provisional application Serial Number 60/236,988 filed on September 29, 2000, which is incorporated herein by reference.

FIELD OF INVENTION

The present invention relates to laminated paper stocks. In particular, the paper stocks are made into flexible packaging having enhanced printability and processability properties.

BACKGROUND OF THE INVENTION

The growth of the retail market for selling cut size paper has created new demands for distribution and delivery of ream paper to individual customers. The demands for retail sales of ream paper includes stronger packaging to withstand the rigors of handling individual reams of paper and improved graphics and appeal of the package to attract the customer and to differentiate the product among the many packages of ream paper on the store shelves.

A number of variations of traditional ream packaging alternatives have been developed to achieve these goals. These included using higher strength paper and laminating resins, all film structures, film laminations and heavier gauge papers for improved strength and coated papers, specialty printing inks and film laminations for improved visual appeal. However, these film structures were limited by the lack of stiffness, poor machinability and relatively high cost.

In general, the prior art has shown laminated structures comprised of polymeric film and paper for a variety of applications. Representative patents include U.S. Patent Nos. 6,030,759 to Gula et al.; 6,004,732 to Alyward et al.; 5,994,045 to Bourdelais et al.; 5,968,695 to Gula et al.; and 5,888,643 to Aylward et al. which all disclose specialty laminates comprising paper/polypropylene laminates in combination with other materials or layers, useful as photographic elements.

U. S. Patent No. 5,891,580 to Fricke et al. discloses a method for adhering biaxially oriented polypropylene to paper substrates with certain polyurethane adhesives.

U.S. Patent No. 3,862,869 to Peterson et al. discloses the preparation of a tear-resistant laminate by adhesively bonding biaxially oriented polypropylene to a paper substrate employing a polyolefin melt adhesive.

U.S. Patent No. 3,775,549 to Matsuda et al. discloses an insulation material for electric power cables comprising biaxially oriented polypropylene laminated to paper with a polyolefin melt adhesive.

However, unlike the known art, the invention provides a laminated paper stock, for flexible packaging, made of at least one biaxially oriented polymeric film, an adhesive material and a paper substrate. Paper film lamination provides a good combination of ease of runnability on packaging equipment designed and used for traditional paper based ream packaging materials and the improved strength and graphics appeal afforded by the film structures

Thus, it is a broad objective of the invention to provide flexible packaging having enhanced printability and processability properties.

Another object of the invention is to provide a ream wrap substrate that performs superior to other paper/film packaging structures.

Another specific object of the invention is to provide a ream wrap that processes well on existing ream packaging equipment at costs comparable to paper based ream wrap substrates without the need for significant machine adjustments or modifications.

Another specific object of the invention is to provide a ream wrap package having excellent strength and superior runnability.

SUMMARY OF THE INVENTION

In the present invention, these purposes, as well as others which will be apparent, are achieved generally by providing a laminated paper stock comprised at least one biaxially oriented polymeric film, an adhesive material and a paper substrate. These paper stocks are preferably used to produce flexible packaging for wrapping paper.

Other objects, features and advantages of the present invention will be apparent when the detailed description of the preferred embodiments of the invention are considered which should be construed in an illustrative and not limiting sense as follows:

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

In accordance with the present invention a laminated paper stock comprised of at least one biaxially oriented polymeric film; an adhesive material; and a paper substrate is provided.

The biaxially oriented polymeric film is selected from the group consisting of polypropylene, polyester, nylon, polystyrene and polyethylene.. Prefereably polyethene is used and is selected from the group consisting of low density polyethylene (LDPE), linear low density polyethylene (LLDPE), metallocene low density polyethylene (m-LDPE) and high density polyethylene (HDPE). In a preferred embodiment the polymeric film is a biaxially oriented high density polyethylene.

The polymeric film is laminated to the paper substrate using an adhesive resin. The adhesive material used in the invention are selected from the group consisting of low density polyethylene (LDPE), linear low density polyethylene (LLDPE), metallocene low density polyethylene (m-LDPE), high density polyethylene (HDPE), polypropylene (PP), ethylene vinyl acetate (EVA), ethylene methyl acrylate (EMA), ethylene acrylic acid (EAA), polyethylene terepthalate (PET) and Ionomer.

The polymeric film surface or the paper surface of the substrate can be printed on.

The paper substrate is used in the invention is selected from the group consisting of cellulosic and synthetic materials. In a preferred embodiment the paper substrate is bleached paper or paperboard.

It is also within the scope of the invention to add additional biaxially oriented polymeric films on either the uncoated paper substrate surface or on the film surface or both. Multiple film layers are also encompassed by the invention.

The laminated paper stock is preferably used to make flexible packaging for wrapping paper. The laminated stocks provide good moisture barrier properties for ream wrap applications.

The invention also provides a method of making a laminated paper stock comprising the steps of providing at least one biaxially oriented polymeric film; and adhering the film to a paper substrate.

The film is selected from the group consisting of polypropylene, polyester, nylon, polystyrene and polyethylene. Preferably, the polymeric film is stretched in both the MD and CD direction prior to being laminated to the paper substrate. This increases the strength properties of the film and resulting laminate.

Polyethene is a preferred material used. As previously described, the types of polyethylene used are selected from the group consisting of low density polyethylene (LDPE), linear low density polyethylene (LLDPE), metallocene low density polyethylene (m-LDPE) and high density polyethylene (HDPE).

The film is adhered to the paper substrate by an adhesive material selected from the group consisting of low density polyethylene (LDPE), linear low density polyethylene (LLDPE), metallocene low density polyethylene (m-LDPE) and high density polyethylene (HDPE), polypropylene (PP), ethylene vinyl acetate (EVA), ethylene methyl acrylate (EMA), ethylene acrylic acid (EAA), polyethylene terepthalate (PET) and Ionomer.

The resulting laminate formed can be further treated to enhance printability and/or to enhance processability. Such treatments include but are not limited to corona treatments and slip treatments.

The invention further provides a method of making a flexible package for wrapping paper. The laminated paper stock made of at least one biaxially oriented polymeric film is adhered to a paper substrate and then formed into a package.

In general, the invention provides a flexible package for wrapping paper made by laminating a clear polymer film to a paper substrate. In a preferred embodiment, the paper is preferably 15-60 lb/3000 ft^2 of a white paper. The paper provides an excellent substrate for printing on or, in the case of reverse printed film, a background that highlights and showcases the graphic print design. The paper also provides the stiffness and bottom surface characteristics that allows this structure to process well on production paper packaging equipment.

An extrudable or adhesive coating is applied to the paper and film to laminate the clear or reverse printed overlaminate film to the paper. The film protects the buried printed surface and adds considerable gloss and visual appeal to the finished package. The film also increases the strength of the finished product to make it ideally suited for retail sales environment.

The preferred film for this invention is a biaxially oriented high density polyethylene film with optional specialty treatments on the inside and outside surfaces. Typical film thickness can range from 30 gauge (0.00030" thickness) to 2 mil (o.002") depending on performance requirements.

Numerous paper options may be used to provide unique functional characteristics. These may include brightness adjustments and various hold out coatings for excellent printing characteristics.

Paper and lamination characteristics may be manipulated to improve the physical properties of the finished structure. When the film is laminated to the paper, the film is limited in its ability to stretch and absorb the energy to maintain the integrity of the package. Options to improve the physical properties, include, but are not limited to, changing the furnish of the paper, modifying the internal bond of the paper, adjusting the stretch characteristics of the paper, increasing moisture level of the paper, process/machine conditions during lamination or laminating resins or adhesives to modify the bond between the paper and film.

The invention packaging provides improved strength for the retail ream paper market. Traditional paper-paper laminated reams exhibit poor strength performance resulting in likely significant ream wrap damage and subsequent returns from retail stores.

Puncture test results, which are a predictive test for durability in a retail environment, showed surprisingly good results with the invention packaging, in particular with packaging including a biaxially oriented high density polyethylene film. These results were far superior to typical low density polyethylene structures which have lower strength characteristics and behave poorer in the drop tests.

Glue tests conducted on the invention packaging showed superior glueability to the paper/film structure. In particular the embodiments using the biaxially oriented high density polyethylene showed excellent glueability to the paper substrates.

The laminated structure of the invention performs with ease on equipment designed for traditional paper/paper laminated ream wraps. This package feeds into the packaging equipment especially well and seals remarkably well using hot melt glues for sealing traditional paper ream wraps. Additionally, the surface characteristics of this structure allows the material to run at high speed on commercial packaging equipment with no or few machine adjustments. Other known paper/film structures require special glues and don't run as well or as fast on their equipment as traditional paper/paper ream wraps.

The advantage of the invention paper stock is in the provision of a ream wrap product having excellent strength and superior runnability. The strength of the wrap is best characterized by the drop test performance. The drop test was developed to simulate the durability and performance of the wrapper in the retail distribution and sales environment. This is a semi destructive test on the packaged paper.

The attributes of the invention packaging contribute to the excellent runnability and appearance of the wrapper including print appearance, tightness of wrapped ream, glueability and durability of the glued flaps, material handling on the packaging line, packaging run speed, and others.

The following examples will serve to illustrate the invention. These examples are merely representative and are not inclusive of all the possible embodiments of the invention.

EXAMPLE 1

Small sample rolls of the laminated paper stock of the invention were tested for puncture resistance. The test was conducted as a first level test to predict performance in retail sales environment. Puncture test results showed surprisingly good performance with the laminated paper stocks of the invention, in particular with the biaxially oriented high density polyethylene film embodiment.

EXAMPLE 2

Biaxially oriented high density polyethylene film was laminated to paper in accordance with the invention and drop tested using the procedure described below.

Procedure

The drop test uses an MTS Shock Test Machine to simulate dropping a ream of paper 18 inches. Reams were conditioned indoors for 8 hours before testing. They are then mounted on the machine at an angle so one corner of the ream will impact before the rest of the ream. Impact is at an 8° angle. The angle of impact is critical to drop performance and the Shock Test Machine accurately reproduces this angle for each ream. The results +/- 5 for lots of 100 dropped reams are considered significant.

Results

The pallet of paper arrived in excellent shape and no reams were torn when removed from the cases. When 100 of the reams were dropped none of them ripped. None of the reams had glue issues either when removed from the cases or after dropping.

EXAMPLE 3

Laminated ream wrap packages were made in accordance with the invention. Two different glues were used to make the packages and were tested. Sample A was made with a hot melt glue available from National Starch (34-2557 EVA) and Sample B was made with a hot melt glue available from HB Fuller (9255).

The samples were subjected to the drop test as described in Example 2.

<u>Results</u>

When 99 reams of Sample A were dropped none of them tore. On 41 of the reams, however, the glue on the top flap failed and the flap opened. On one other ream the glue on the bottom flap failed. The remaining 57 reams survived the drop without failure. All adhesive failures resulted from the hot melt glue not adhering to the film surface. None of the failures gave any evidence of fiber tear. Sample B – none of the 99 dropped reams tore or had glue failure.

EXAMPLE 4

Laminated ream wrap packages were made in accordance with the invention. Drop test performance and end flap seal integrity were tested on Samples A and B which are described in Example 3.

The samples were subjected to the drop test as described in Example 2. The samples were also subjected to a Glue Peel Test.

<u>Glue Peel Test Procedure</u>

After overnight conditioning, the end flaps of the reams were peeled open. Peeling was done carefully so that the fiber tear was minimized. The length of the glue bead which gave fiber tear was measured and compared to the total length of the glue bead (rounded to the nearest 10%). Fiber tear of 50% or greater is rated an acceptable seal.

Results

The pallet of paper arrived in excellent shape. No damage to the cases or reams was observed. Before testing, cases were conditioned overnight at standard TAPPI conditions.

One hundred reams of each sample were dropped using the drop test procedure described. None of the reams of Sample A ripped, but one end flap popped open on 7 of the reams. For 6 of these 7 reams it was the top flap which opened.

The rip performance of reams of Sample B was equally good (no tears) and none of the end flaps opened when dropped. A perfect score in the drop test correlates well with rugged performance in the retail market.

The glue performance of each sample was examined. It was observed that the glue used in Sample B gave over twice the amount of fiber tear as the glue used in Sample A.

The foregoing description of various and preferred embodiments of the present invention has been provided for purpose of illustration only, and it is understood that numerous modifications, variations and alterations may be made without departing from the scope and spirit of the invention as defined in the appended claims hereto.